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# **AERONAUTICAL ENGINEERING**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

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# Typical Report Citation and Abstract

- ❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

## Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms



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# AERONAUTICAL ENGINEERING

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*A Continuing Bibliography (Suppl. 366)*

JANUARY 23, 1998

## 01 AERONAUTICS

**19980002685** General Accounting Office, Accounting and Information Management Div., Washington, DC USA  
**Report to the Secretary of Defense. Financial Management: DOD's Liability for Aircraft Disposal Can Be Estimated**  
Nov. 1997; 22p; In English

Report No.(s): GAO/AIMD-98-9; B-273004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In October 1990, the Federal Accounting Standards Advisory Board (FASBO) was established by the Secretary of the Treasury, the Director of The Office of Management and Budget (OMB), and the Comptroller General of the USA to consider and recommend accounting standards to address the financial and budgetary information needs of the Congress, executives agencies, and other users of federal financial information. Using a due process and consensus building approach, the nine-member Board, which has since its formation included a member from DOD, recommends accounting standards for the federal government. Once FASAB recommends accounting standards, the Secretary of the Treasury, the Director of OMB, and the Comptroller General decide whether to adopt the recommended standards.

Author

*Financial Management; USA; Accounting*

**19980003365**

**AN/ARC-220 nap-of-earth HF communications systems and helicopter antenna considerations**

Roesler, D. P., Rockwell, USA; IEE Conference Publication; 1997; ISSN 0537-9989, no. no. 441, pp. 211-215; In English; Techniques, Jul. 7-10, 1997, Nottingham, UK; Copyright; Avail: Issuing Activity

Modern HF (High Frequency, 2- to 30-MHz) equipment employed by today's communicator contains many technological applications and breakthroughs relative to communications equipment of the past. Today's HF communications equipment has many of the characteristics that reflect the dynamic commercial computer industry. The new HF Radio used in airborne operational environments, AN/ARC-220, contains many of these technologies applied to the HF near vertical incidence skywave (NVIS) communications network. This paper discusses the considerations necessary for a properly developed network infrastructure for maximum ARC-220 mission performance. This paper also describes the HF propagation characteristics and antenna considerations encountered in typical NVIS missions using the ARC-220, especially in nap-of-earth flight operations. Available lessons learned and performance characteristics will be reviewed.

Author (EI)

*Communication Networks; Sky Waves; Aircraft Communication; Antenna Arrays; Radio Transmission; Antennas; Mobility; Radio Equipment*

**19980003809** National Aerospace Lab., Tokyo, Japan

**NAL Research Progress, 1995**

Abe, M., National Aerospace Lab., Japan; Nayuki, T., National Aerospace Lab., Japan; Yoshida, M., National Aerospace Lab., Japan; Matsuo, Y., National Aerospace Lab., Japan; Mar. 29, 1996; 127p; In English; Original contains color illustrations  
Report No.(s): PB96-213806; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The report presents: Research Highlights in the areas of: Computational and Experimental Aerodynamics; Materials and Structures; Control and Guidance; Aircraft Propulsion; Space Propulsion and Transportation System; Space Technology and Application; and Research Activities.

NTIS

*Aerospace Engineering; Computational Fluid Dynamics; Technology Utilization; Aircraft Engines*

**19980003810** Nanjing Univ. of Aeronautics and Astronautics, Nanjing, Jiangsu, China

**Journal of Nanjing University of Aeronautics and Astronautics, Volume 28**

Jun. 1996; 152p; In Chinese; Portions of this document are not fully legible; See also PB96-156583.

Report No.(s): PB96-214010; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Topics considered include: Integrated Optimization of Aircraft Aerodynamic Performance and Radar Cross Section; Some Problems on Aerodynamic Configuration for the Single-Rotor Helicopter; Experimental Study of Flow Induced Cavity Oscillation and Its Suppression by Sound Excitation; Experimental Study of the Performance of an Ejector with a Non-Axisymmetrically Lobed Nozzle; and An On-Line Holographic Method for Measurement of Particle Distribution of an Atomized Rotating Field.

NTIS

*Aircraft Performance; Research and Development*

## 02 AERODYNAMICS

*Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.*

**19980002478** National Aerospace Lab., Aerodynamics Div., Amsterdam, Netherlands

**Computation of the Flow about a F16-Like Configuration for Several Flow Conditions**

vandenBerg, J. I., National Aerospace Lab., Netherlands; Sytsma, H. A., National Aerospace Lab., Netherlands; Schippers, H., National Aerospace Lab., Netherlands; Apr. 4, 1995; 18p; In English; 13th; AIAA Applied Aerodynamic Conference, 19-22 Jun. 1995, San Diego, CA, USA

Report No.(s): PB97-193270; NLR-TP-95226-U; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

At NLR a CFD technology readiness program has been carried out to demonstrate that current CFD knowledge and capabilities are advanced to such a level that NLR can support air forces by giving advice with regard to aerodynamic matters related to the operational use of military aircraft. As a representative test case the flow field about a F16-like configuration is computed for several flow conditions including engine power settings. The results as obtained with the computational method based on the Euler equations show that the main flow features such as vortices developing at the strake and the wing tip as well as the complex shock structure above the wing are captured quite well. Detailed load distributions as represented by comparison of computed and measured pressure distributions over the wing, body and horizontal tail plane, indicate that the accuracy of the results is satisfactory for the conditions under consideration. Small differences are attributed to the absence of viscous terms in the Euler method. In order to investigate these viscous effects a method based on some form of the Navier-Stokes equations should be taken into account.

NTIS

*F-16 Aircraft; Computational Fluid Dynamics; Flow Distribution; Horizontal Tail Surfaces; Navier-Stokes Equation*

**19980002572** Tsentralni Aerogidrodinamicheskii Inst., Moscow, USSR

**Investigation of Relaxation Processes in Flow about Models in Hypersonic Wind Tunnels of Different Types Final Report**

Alfyorov, Vadim, Tsentralni Aerogidrodinamicheskii Inst., USSR; Shcherbakov, G. I., Tsentralni Aerogidrodinamicheskii Inst., USSR; Rudakova, A. P., Tsentralni Aerogidrodinamicheskii Inst., USSR; Yegorov, I. V., Tsentralni Aerogidrodinamicheskii Inst., USSR; Skirda, V. N., Tsentralni Aerogidrodinamicheskii Inst., USSR; Jan. 1994; 72p; In English

Contract(s)/Grant(s): F61708-93-W-0695

Report No.(s): AD-A324560; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report presents the theoretical and experimental results related to flows over such simple bodies as semisphere, cone, and wedge. These were investigated in hypersonic wind tunnels of various classes at nearly equal Mach and Reynolds numbers (M from 7.0 to 8.0, Re(o) from 135 to 240) but at notably different free-stream velocities: 790, 2700 and 6000 m/s. Hypersonic resistance and arc-heating wind tunnels and a hypersonic MHD-accelerator wind tunnel, as well as their test equipment are described. A technique to determine parameters of a free stream over a model including gasdynamic ones (M, Re, Re(o), T, P, V, Ho, H) and physico-chemical ones (gamma To, Tv, Tn, Ci), as well as a verification procedure are presented. Experimental data

on pressure distribution over models, shock wave positions/shapes were obtained. The experimental data are compared with respective calculated results obtained by using the VSL theory and the Navier-Stokes equations for the test conditions adopted. Interrelation of the theoretical and test data is shown not to be unambiguous, especially in what concerns locations and shapes of shock waves. The VSL theory is employed to compute local parameters of the shock layer. The influence of alkali metal seed on the rate of relaxation in the shock-layer is considered. Features of profiles of both temperature and air component concentrations in the shock layer are shown to be useful in explaining a set of phenomena revealed in experiments: a radiation offset upstream of a sphere hypervelocity shock layer, a radiation relaxation at a cone apex. The impact of the seed metal is shown to be insignificant.

DTIC

*Wind Tunnel Models; Reynolds Number; Resistance Heating; Physical Chemistry; Navier-Stokes Equation; Magnetohydrodynamics; Mach Number; Hypersonic Wind Tunnels*

**19980002715** NASA Langley Research Center, Hampton, VA USA

**Internal Performance of a Fixed-Shroud Nonaxisymmetric Nozzle Equipped with an Aft-Hood Exhaust Deflector**

Asbury, Scott C., NASA Langley Research Center, USA; Nov. 1997; 74p; In English

Contract(s)/Grant(s): RTOP 522-25-31-15

Report No.(s): NASA/TM-97-206255; NAS 1.15:206255; L-17664; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An investigation was conducted in the model preparation area of the Langley 16-Foot Transonic Tunnel to determine the internal performance of a fixed-shroud nonaxisymmetric nozzle equipped with an aft-hood exhaust deflector. Model geometric parameters investigated included nozzle power setting, aft-hood deflector angle, throat area control with the aft-hood deflector deployed, and yaw vector angle. Results indicate that cruise configurations produced peak performance in the range consistent with previous investigations of nonaxisymmetric convergent-divergent nozzles. The aft-hood deflector produced resultant pitch vector angles that were always less than the geometric aft-hood deflector angle when the nozzle throat was positioned upstream of the deflector exit. Significant losses in resultant thrust ratio occurred when the aft-hood deflector was deployed with an upstream throat location. At each aft-hood deflector angle, repositioning the throat to the deflector exit improved pitch vectoring performance and, in some cases, substantially improved resultant thrust ratio performance. Transferring the throat to the deflector exit allowed the flow to be turned upstream of the throat at subsonic Mach numbers, thereby eliminating losses associated with turning supersonic flow. Internal throat panel deflections were largely unsuccessful in generating yaw vectoring.

Author

*Wind Tunnel Tests; Exhaust Nozzles; Deflectors*

**19980002796** Notre Dame Univ., Dept. of Aerospace and Mechanical Engineering, IN USA

**An Experimental Investigation of the Confluent Boundary Layer on a High-Lift System Final Report**

Thomas, F. O., Notre Dame Univ., USA; Nelson, R. C., Notre Dame Univ., USA; 1997; 54p; In English

Contract(s)/Grant(s): NAG2-905

Report No.(s): NASA/CR-97-112979; NAS 1.26:112979; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This paper describes a fundamental experimental investigation of the confluent boundary layer generated by the interaction of a leading-edge slat wake with the boundary layer on the main element of a multi-element airfoil model. The slat and airfoil model geometry are both fully two-dimensional. The research reported in this paper is performed in an attempt to investigate the flow physics of confluent boundary layers and to build an archival data base on the interaction of the slat wake and the main element wall layer. In addition, an attempt is made to clearly identify the role that slat wake / airfoil boundary layer confluence has on lift production and how this occurs. Although complete LDV flow surveys were performed for a variety of slat gap and overhang settings, in this report the focus is on two cases representing both strong and weak wake boundary layer confluence.

Author

*Airfoils; Leading Edges; Two Dimensional Boundary Layer; Trailing Edges; Vortex Flaps; Flow Characteristics; Flow Coefficients*

**19980002818** Technische Univ., Faculty of Applied Mathematics, Twente, Netherlands

**Instabilities of Stationary Inviscid Compressible Flow Around an Airfoil**

Vanbuuren, R., Technische Univ., Netherlands; Kuerten, J. G. M., Technische Univ., Netherlands; Geurts, B. J., Technische Univ., Netherlands; Dec. 1996; ISSN 0169-2690; 35p; In English; Figures in this document may not be legible in microfiche

Report No.(s): PB97-181614; MEMO-1360; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the paper, the authors numerically solve the stationary inviscid flow around an airfoil. An analysis of the limiter shows that it is possible to obtain a machine accurate solution with an asymmetric minmod limiter if an implicit scheme with low CFL number is used. For higher CFL number, the convergence rate of this scheme increases considerably at the expense of a strong increase in the final residual level. A further study of the differences revealed that the steady state obtained with the implicit method is in fact unstable and can only be found due to the dissipation present in the implicit method. The stall in convergence with the explicit method is caused by a physical instability in the wake behind the airfoil. This instability is also predicted by linear stability theory and confirmed by a grid refinement study.

NTIS

*Airfoils; Compressible Flow; Inviscid Flow; Flow Equations; Asymmetry; Computational Grids*

**19980003319** Technische Univ., Faculty of Aerospace Engineering, Delft, Netherlands

**Main Rotor Disc Edge Vortices: An Analytical Model**

Roos, J. P., Technische Univ., Netherlands; Dec. 1996; 83p; In English

Report No.(s): PB97-190169; MEMO-731; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This graduation report presents an analytical model for the disc edge vortices behind the helicopter main rotor. The model has been developed to come to a better understanding of the formation of these vortices and to be able to simulate their influence on helicopter behavior during low speed flight. The model represents a first step into the direction of a more general model, capable of predicting the influence of main rotor/tail rotor interaction on helicopter stability and control.

NTIS

*Helicopters; Wing Tip Vortices; Wakes; Stability; Mathematical Models; Rotary Wings; Tail Rotors; Blade-Vortex Interaction*

**19980003339** Toledo Univ., Dept. of Mechanical, Industrial and Manufacturing Engineering, OH USA

**Aeroelastic Analysis of Counter Rotation Fans Final Report, 1 Sep. 1986 - 31 Dec. 1993**

Keith, Theo G., Jr., Toledo Univ., USA; Murthy, Durbha V., Toledo Univ., USA; Dec. 1997; 6p; In English

Contract(s)/Grant(s): NAG3-742

Report No.(s): NASA/CR-97-112951; NAS 1.26:112951; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Aeroelastic problems in turbomachinery and propfans can be static or dynamic in nature. The analysis of static aeroelastic problems is involved primarily with determination: (a) of the shape of the blades and the steady aerodynamic loads on the blades (which are inter-dependent), (b) of the resultant steady stresses and (c) of the static instability (divergence) margin, if applicable. In this project, we were concerned exclusively with dynamic aeroelastic behavior. The analysis of dynamic aeroelastic problems is involved with the determination: (a) of the unsteady aerodynamic loads on blades and the dynamic motion of the blades (which are again inter-dependent), (b) of the resultant dynamic stresses and their effect on fatigue life and (c) of the dynamic instability (flutter), if applicable. There are two primary dynamic aeroelastic phenomena of interest to designers of turbomachinery and propfans: flutter and forced response. Flutter generally refers to the occurrence of rapidly growing self-excited oscillations leading to catastrophic failure of the blade. When certain nonlinear phenomena are present, flutter response may lead to a potentially dangerous limit cycle oscillation rather than an immediate catastrophic failure. Forced response generally refers to the steady-state oscillations that occur as a consequence of excitations external to the rotor in question. These excitations typically result from the presence of upstream obstructions, inflow distortions, downstream obstructions, or mechanical sources such as tip-casing contact or shaft and gear meshing. Significant forced response leads to blade fatigue, and at design conditions, generally contributes to a degradation of blade life. At other operating conditions, forced response may lead to catastrophic failure due to severe blade fatigue in a short duration of time.

Derived from text

*Aeroelasticity; Turbomachinery; Counter Rotation; Dynamic Characteristics; Aerodynamic Loads; Flutter; Prop-Fan Technology; Fatigue Life*

**19980003829** National Aerospace Lab., Tokyo, Japan

**Suspending Wind-Tunnel Test for the ALFLEX Vehicle**

1996; 29p; In Japanese; Portions of this document are not fully legible; See also N92-28152 and PB97-136006.

Report No.(s): PB97-141105; NAL-TR-1306; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

A suspending wind-tunnel test for the Automatic Landing Flight Experiment (ALFLEX) was conducted as part of the research on an unmanned winged re-entry vehicle (HOPE). The suspending flight was simulated in the wind-tunnel using a 40% scaled model of the ALFLEX vehicle to validate the design of the suspending system and to identify the aerodynamic characteris-

tics of the vehicle for designing a control system. As a result, problems of some elements of the system are identified and a counter-plan is considered. The flight test plan of AFLEX is then fixed based on these results.

NTIS

*Automatic Landing Control; Reentry Vehicles; Wind Tunnel Tests; Aircraft Models*

**19980003841** McDonnell-Douglas Corp., Advanced Transport Aircraft Systems, Long Beach, CA USA

**Aeroelastic Analysis of Aircraft: Wing and Wing/Fuselage Configurations**

Chen, H. H., McDonnell-Douglas Corp., USA; Chang, K. C., McDonnell-Douglas Corp., USA; Tzong, T., McDonnell-Douglas Corp., USA; Cebeci, T., McDonnell-Douglas Corp., USA; May 1997; 66p; In English

Contract(s)/Grant(s): NAS2-14091

Report No.(s): NASA/CR-97-113008; NAS 1.26:113008; MDC-97K0164; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A previously developed interface method for coupling aerodynamics and structures is used to evaluate the aeroelastic effects for an advanced transport wing at cruise and under-cruise conditions. The calculated results are compared with wind tunnel test data. The capability of the interface method is also investigated for an MD-90 wing/fuselage configuration. In addition, an aircraft trim analysis is described and applied to wing configurations. The accuracy of turbulence models based on the algebraic eddy viscosity formulation of Cebeci and Smith is studied for airfoil flows at low Mach numbers by using methods based on the solutions of the boundary-layer and Navier-Stokes equations.

Author

*Aerodynamics; Aeroelasticity; Wings; Aerodynamic Configurations; Turbulence Models; Mach Number; Navier-Stokes Equation; Computational Fluid Dynamics; Finite Element Method*

### 03

## AIR TRANSPORTATION AND SAFETY

*Includes passenger and cargo air transport operations; and aircraft accidents.*

**19980002428** Federal Aviation Administration, Aviation Security Human Factors, Atlantic City, NJ USA

**Test and Evaluation Plan for Airport Demonstration of Computer-Based Training for Checkpoint Operations *Final Report***

Neiderman, E. C., Federal Aviation Administration, USA; Aug. 1996; 92p; In English

Report No.(s): PB97-169312; DOT/FAA/AR-96/09; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This document is the Test and Evaluation Plan (TEP) to evaluate the effectiveness of a Computer-Based Training (CBT) system to enhance screener performance to detect threat objects at the checkpoint. The test and evaluation (T&E) will determine the effectiveness of the CBT to meet the requirements set in the Critical Operational Issues and Criteria (COICs) and Additional Evaluation Issues and Criteria (AEICs). The testing will be conducted at 10 U.S. airports and the results will be analyzed and published in a test report.

NTIS

*Computer Assisted Instruction; X Ray Detectors; Airports; Security; Explosives*

**19980002955** National Transportation Safety Board, Washington, DC USA

**National Transportation Safety Board Aircraft Accident Report: In-Flight Icing Encounter and Loss of Control, Simmons Airlines, d.b.a. American Eagle Flight 4184 Avions de Transport Regional (ATR) Model 72-212, N401AM Roselawn, Indiana, Volume 2, Response of Bureau Enquetes-Accidents to Safety Board's Draft Report**

Jul. 09, 1996; 338p; In English

Report No.(s): PB96-910402; NTSB/AAR-96/02; Copyright Waived; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Volume II contains the comments of the Bureau Enquetes-Accidents on the Safety Board's draft of the accident report. The comments are provided in accordance with Annex 13 to the Convention on International Civil Aviation. Volume I of this report explains the crash of American Eagle flight 4184, an ATR 72 airplane during a rapid descent after an uncommanded roll excursion. The safety issues discussed in the report focused on communicating hazardous weather information to flightcrews, Federal regula-



tions on aircraft icing and icing certification requirements, the monitoring of aircraft airworthiness, and flightcrew training for unusual events/attitudes.

NTIS

*Aircraft Accidents; Aircraft Icing; Aircraft Accident Investigation*

**19980003343** Federal Aviation Administration, Aviation Security Human Factors, Atlantic City, NJ USA

**Test and Evaluation Plan for Airport Demonstration of Selection Tests for X-ray Operators Final Report**

Neiderman, E. C., Federal Aviation Administration, USA; May 1997; 71p; In English

Report No.(s): PB97-176457; DOT/FAA/AR-97/29; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The document discusses the Test and Evaluation Plan (TEP) to evaluate the effectiveness of selection tests to hire screener job candidates who possess the ability to detect threat objects at the checkpoint. The test and evaluation (T&E) will determine the effectiveness of the selection tests to meet the requirements set in the Critical Operational Issues and Criteria (COICs) and Additional Evaluation Issues and Criteria (AEICs). The testing will be conducted at major U.S. airports and the results will be analyzed and published in a test report.

NTIS

*Airport Security; Airline Operations; X Ray Inspection*

**19980003415** NERAC, Inc., Tolland, CT USA

**Air Traffic Congestion and Capacity: (Latest citations from the NTIS Bibliographic Database)**

Feb. 1997; In English; Page count unavailable. Supersedes PB96-851860

Report No.(s): PB97-856199; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning airport traffic density, congestion, and capacity. Included are flow control, enroute metering, queuing, scheduling, and airport regulations. Air traffic density models and studies of the National Airspace Plan, relating to forecast density and capacity requirements, are also included. The studies cover air carrier, helicopter, short haul feeder, and general aviation operations. Some studies pertain to the improvement of airport facilities, such as additional runway construction, landside operations, and terminal air traffic control procedures, equipment, and training. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Air Traffic*

**19980003420** Army Safety Center, Fort Rucker, AL USA

**Flightfax, Volume 26**

Oct. 1997; 12p; In English

Report No.(s): AD-A330063; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This periodical deals with all aspects of army aviation. In this issue the emphasis is placed on the recent mishaps. In the last few months, a number of mishaps involving aircraft parts separating during flight.

DTIC

*Aircraft Accidents; Aircraft Equipment; Aircraft Safety*

**19980003696**

**Increasing throughput of the New Tokyo International Airport pipeline**

Matsumoto, Hiroshi, Control Technology Dep.; Naganuma, Takaomi; Nezu, Tomoo; Nakamura, Jiro; NKK Technical Review; July, 1997; ISSN 0915-0544, no. no. 76, pp. 29-34; In English; Copyright; Avail: Issuing Activity

The aviation fuel pipeline for the New Tokyo International Airport (NTIA) has operated smoothly since it was put into service. As the fuel demand for the NTIA increased, it was feared that the pipeline throughput might not be adequate, and that the stable fuel supply might be interrupted by earthquakes or large, neighboring construction projects. The NTIA Authority planned to increase the throughput by adding a booster pump station. NKK was responsible for establishing a new control system in addition to the mechanical and piping work. Commissioning was completed in March 1996. An outline of the new control system is reported in this paper.

Author (EI)

*Aircraft Fuels; Pipelines; Airports; Fuel Pumps*

## AIRCRAFT COMMUNICATIONS AND NAVIGATION

*Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.*

**19980002377** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany

### **From Sensors to Situation Assessment *Vom Sensor zur Situationserkennung***

Fuerstenau, Norbert, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996; ISSN 0939-298X; 211p; In English; In German; From Sensors to Situation Assessment, 3-4 May 1995, Braunschweig, Germany; Also announced as 19980002378 through 19980002389

Report No.(s): DLR-MITT-96-02; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The proceedings of a conference entitled "From Sensors to Situation Assessment" is presented. The seminar concentrated primarily on tools and components which are required for assessing the traffic situation in airport ground traffic management systems. Most contributions in this seminar are based on work performed at the Institute of Flight Guidance. They were complemented by lectures from external experts, which are of special interest with respect to SMGCS. The seminar consisted of four sessions which covered the general aspects of ground movement management systems, the sensors for acquiring traffic data, tools and strategies for automatic traffic situation modelling and planning, and man-machine interfaces for interaction of the automatic system with the human operator. This current volume collects in four sections the twelve papers presented in the corresponding four sessions of the colloquium.

Derived from text

*Conferences; Airports; Sensors; Human-Computer Interface; Management Systems; Traffic Control; Automatic Control; Airfield Surface Movements*

**19980002378** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany

### **Situation Modelling as Applied to Airport Ground Traffic**

Winter, Heinz, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996, pp. 13-21; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The functional structure of airport ground traffic management is analysed and described as a network of coupled work systems. In these work systems human operators (air traffic controllers, pilots and car drivers) are cooperating to manage the traffic on the surface of airports. They are generally supported by automation tools, like the TARMAC and TAGS systems under development at DLR. The functional architecture of the work system Airport Tower is discussed, and the DLR philosophy of automation is illustrated using this functional architecture. The COMPAS system, which is in operational use at the Frankfurt Airport since 1989, is used as a successful example of this philosophy. The role of sensing and sensors in classical control loops as well as in the surface traffic management process is analysed. The importance of explicit representations of the goal and the situation for highly automated surface traffic management is discussed, and the representation problem is highlighted.

Author

*Airports; Automatic Control; Traffic Control; Management Systems; Systems Simulation; Airfield Surface Movements*

**19980002379** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany

### **Elements and Functions of the Future Airport Ground Movement Management System**

Dippe, Dietmar, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996, pp. 23-35; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

An Airport Ground Movement Management System is a system with high complexity that can be influenced by different other systems and by involved controllers, pilots and vehicle drivers. This article gives an overview of the different functions of an Airport Ground Movement Management System and of the functional elements that are necessary to perform these functions. With the description of the actual system and especially its shortcomings the need for improvements is demonstrated. This analysis has then been the basis for the definition of requirements for the future system. With these requirements it is finally possible to describe the new functional elements that are necessary to perform the functions within the future system.

Author

*Airports; Traffic Control; Automatic Control; Management Systems; Ground Support Systems; Airfield Surface Movements*

**19980002381** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany

### **Automatic Recognition of Aircraft Registration Marks**

Doehler, H. U., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Groll, E., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Hecker, P., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation

Assessment; 1996, pp. 53-64; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A sensor based system for automatic identification and recording of aircraft nationality and registration marks (ARM) is presented. This system is intended to support a proposed airport management system, namely Taxiway and Ramp Management and Control-Surveillance and Communication (TARMAC-SC), in the future. The proposed method is based upon an optical character recognition (OCR) statistical classifier, which references a knowledge base of existing ARM. The classifier is easily trained through the presentation of single characters to the system. Prototype features, insensitive to variations in font, size, and slant, are used for individual character recognition. After processing is completed, the results of the ARM identification are passed to the data fusion process of the master control system, TARNIAC-SC.

Author

*Airports; Character Recognition; Ground Support Equipment; Traffic Control; Management Systems; Airfield Surface Movements; Image Processing*

**19980002382** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. For Radio Frequency Technology, Wessling, Germany  
**A New Solution for Improved Ground Traffic Management: The Near-Range Radar Network**

Schroth, A., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Bethke, K. H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Roede, B., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Sauer, Th., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Schneider, M., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996, pp. 65-97; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

After some introductory notes with respect to the need for novel, advanced sensors for surface movement guidance and control the DLR Near-Range Radar System (NRN) will be explained and a general system description will be given. The functional characteristics and the structure of a single radar station will be discussed in detail. Due to sophisticated processing of echo signals of expanded pulses, targets with a backscattering cross section of 1 sq m can be detected at a distance of 1 km utilizing fixed, nonrotating antennas having a broad sector characteristics in the azimuth and low power transmitters (less than 10 W). From the complex valued range echo profiles, measured by the four stations of a NRN module, the so called rolling status for a plurality of targets including classification can be derived. The present status of the development will be presented and the remaining work will be sketched. The field test of the basis station is expected for the fall of 1995.

Author

*Airfield Surface Movements; Traffic Control; Automatic Control; Radar Networks; Management Systems; Ground Support Equipment; Radar Tracking*

**19980002383** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany  
**Data Fusion for a Surface Movement Guidance and Control System**

Hurrass, K. H., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Meier, Ch., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996, pp. 99-110; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The operational requirements concerning the surveillance part of a Surface Movement Guidance and Control System (SMGCS) can be fulfilled only by a multi-sensor system. The philosophy is to use each type of sensor only for its adequate task. An important part of this system is the data fusion process combining and interpreting the information of the sensors. Its objective is to provide a consistent traffic situation to the controllers, pilots and SMGCS subsystems for planning and guidance. The DLR concept on SMGCS data fusion and its actual development status is presented.

Author

*Airfield Surface Movements; Airports; Multisensor Applications; Multisensor Fusion; Traffic Control; Ground Support Equipment*

**19980002385** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany  
**Situation Assessment Within the Context of Dynamic Planning**

Boehme, Dietmar, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996, pp. 125-133; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Presupposing that computer decision support will become more and more necessary in order to realize an "intelligent", plan-based control of complex technical systems, the role of situation assessment in context or Dynamic Planning is investigated. With the background of future automatization of Air Traffic Control (ATC) a general control structure is explained containing situation assessment as a functional element which detects and evaluates conflicts. The use of the thus obtained information for both to



change the control structure and to determine a suitable planning mode is described. An approach to real-time situation assessment, based on a task decomposition, is given also.

Author

*Air Traffic Control; Complex Systems; Real Time Operation; Computer Techniques; Expert Systems; Decision Support Systems; Human-Computer Interface*

**19980002386** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany

**Conflict Recognition in Air Traffic Control**

Gerling, Wilfried, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996, pp. 135-147; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The prediction of horizontal conflicts between aircraft on the basis of surveillance data may be enhanced if planned changes of aircraft's ground course are taken into consideration. Assuming standard turn maneuvers, the predicted flight paths and the horizontal distances are calculated as a function of time. The estimated constant wind component will strongly influence the appearance of the predicted flight profiles and the prediction of separation distances. The high resolution of the mathematical distance function is condensed by extracting particular conflict attributes which have been defined in terms of severity, urgency, dynamics, and duration. These data which describe the individual situation of a specific aircraft encounter, will build the primary basis for conflict evaluation. The evaluation process will be additionally influenced by secondary parameters which represent the situation of the considered aircraft in view of the surrounding air traffic, the ATC concept and technical systems, and the human controller. The result of this assessment methodology will be a "measure of threat" which may be used by the responsible controller as an advisory aid.

Author

*Air Traffic Control; Surveillance; Air Traffic; Air Navigation; Flight Paths; Position (Location); Computer Techniques; Automatic Control*

**19980002387** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany

**Development of a Taxi Assistance and Guidance System**

Haertl, Dipl.- Ing., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996, pp. 151-164; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The DLR Institute of Flight Guidance is developing the Taxi and Ramp Management and Control system (TARMAC) for future aircraft guidance and control on the ground. The subsystem TARMAC-AS (-Airborne System) supports the pilot during his taxiing maneuvers by offering weather-independent position determination and navigation, monitoring of pilots action, and presentation of the aircraft-related information generated by a planning system on the ground. For the evaluation, a particular cockpit simulator with visual system and with the capability to control up to 50 other aircraft was built. Tests with airline pilots under different traffic and weather conditions provided a wide range of results and confirmed the chosen system layout.

Author

*Aircraft Guidance; Taxiing; Airfield Surface Movements; Surface Navigation; Computer Techniques; Human-Computer Interface; Ground Support Equipment; Management Systems*

**19980002388** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Guidance, Brunswick, Germany

**Situation Representation for Controllers**

Beyer, Ralf, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Schenk, Hans-Dieter, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; From Sensors to Situation Assessment; 1996, pp. 165-185; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Realistic air traffic situation representations are needed because most of the air traffic situation cannot be perceived directly and must be acquired by remote sensing. Appropriate situation representations are also needed by the support tools which become most efficient if they refer to the same situation and in a similar way as the air traffic controller. Air traffic situations can be represented by models and pictures on the basis of objective data which in case of the air traffic controller get transformed by factors like experience and workload and by the type of interaction with the air traffic control system. This has led to certain assumptions on the use of mental models in air traffic control which - if not yet suitable for immediate implementation - at least have helped to structure the process of situation representation and to design the required human/machine interfaces more systematically.

Author

*Air Traffic Control; Human-Computer Interface; Ground Support Systems; Computer Techniques; Automatic Control; Expert Systems; Air Traffic Controllers (Personnel); Systems Simulation*

**19980002389** Technische Hochschule, Lehrstuhl fuer Technische Informatik, Aachen, Germany

**Virtual Reality: Technology and Applications**

Kraiss, K. F., Technische Hochschule, Germany; Kuhlen, T., Technische Hochschule, Germany; From Sensors to Situation Assessment; 1996, pp. 187-208; In English; Also announced as 19980002377; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper provides a survey about Virtual Reality and its possible applications. After a short definition of Virtual Reality the available hardware is described as well as commercial software tools supporting the development of applications. The degree of realism achievable by today's graphics hardware is discussed. The spectrum of possible applications for Virtual Reality is demonstrated by examples from robotics, medicine and scientific visualization. Special attention is given to applications in aviation, i.e., flight simulation and air traffic control (ATC). In particular, an innovative concept for a three dimensional air traffic controllers workplace is presented which makes use of a technique named "Virtual Holography".

Author

*Air Traffic Control; Virtual Reality; Computer Techniques; Human-Computer Interface*

**05**

**AIRCRAFT DESIGN, TESTING AND PERFORMANCE**

*Includes aircraft simulation technology.*

**19980002449** Technische Univ., Faculty of Aerospace Engineering, Delft, Netherlands

**Six Degrees of Freedom Linear Model for Helicopter Trim and Stability Calculation**

Pavel, M., Technische Univ., Netherlands; Dec. 1996; 83p; In English; Figures in this document may not be legible in microfiche Report No.(s): PB97-183032; Memo-M-756; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report develops a six degrees of freedom linear model for helicopter flight dynamics applications. The main assumption made is that the changes in rotor attitude relative to the body are small compared to the changes in the body attitude which is available in the low-frequency domain. The body linear model results writing to non-linear equations of motion with respect to three directions and three rotations are then linearising these equations around a suitable trim condition. The model is quasi-static in nature and considers the rotor aerodynamics forces and moments through their contributions to the 6x6 matrix of derivatives. Therefore, the dynamic effect of the rotor modes is not considered. The model can be applied to any existing helicopter.

NTIS

*Aerodynamic Balance; Aerodynamic Stability; Attitude (Inclination); Equations of Motion; Helicopter Control; Rotor Aerodynamics*

**19980002450** Technische Univ., Faculty of Aerospace Engineering, Delft, Netherlands

**Prediction of the Necessary Flapping Dynamics for Helicopter Flight Simulation**

Pavel, M., Technische Univ., Netherlands; Dec. 1996; 48p; In English; Figures in this document may not be legible in microfiche Report No.(s): PB97-183040; Memo-M-757; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The report explains the influence of rotor flapping degree of freedom on the helicopter motion, describing a method which can be used to predict if the flapping dynamics of the rotor must be included in a helicopter flight dynamics model.

NTIS

*Degrees of Freedom; Flight Simulation; Aerodynamics*

**19980002577** Technische Univ., Faculty of Aerospace Engineering, Delft, Netherlands

**Derivation and Results of an ADAS Program for the Dutch Green Aircraft Pilot-Study**

Fransen, S. H. J. A., Technische Univ., Netherlands; Torenbeek, E., Technische Univ., Netherlands; Oct. 1996; 39p; In English Report No.(s): PB97-190128; Memo-M-735; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Department of Aerospace Engineering of DUT participated in a Pilot-Study, aimed at generating specific knowledge required to develop future cleaner, more silent and fuel efficient transport aircraft. This Memorandum reports about the detailed derivation and results of an ADAS (Aircraft Design and Analysis System) program which enables the user to incorporate (certification) noise requirements into the conceptual design. It also contains results of a mission fuel analysis for two aircraft projects of the Fokker 100 class, with different powerplant systems.

NTIS

*Aircraft Pilots; Aircraft Design; Transport Aircraft*

**19980002740** General Accounting Office, National Security and International Affairs Div., Washington, DC USA

**Unmanned Aerial Vehicles: Outrider Demonstrations Will Be Inadequate to Justify Further Production**

Davis, Tana, General Accounting Office, USA; Warren, John, General Accounting Office, USA; Rodrigues, Louis J., General Accounting Office, USA; Ward, Charles, General Accounting Office, USA; Sep. 1997; 22p; In English

Report No.(s): GAO/NSIAD-97-153; B-276890; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

DOD is not applying lessons learned from prior unmanned aerial vehicle programs to the Outrider ACTD. For example, despite problems with the Pioneer and Hunter stemming from DOD's decision to award further production contracts without conducting operational testing or demonstrating that the system is user-supportable, DOD is pursuing the same strategy for the Outrider. In addition, DOD has underestimated, as it did for the Pioneer and the Hunter programs, the time and effort necessary to integrate non-developmental items into Outrider. Moreover, the Outrider system may not satisfy user needs unless problems associated with meeting joint requirements are resolved and interoperability with other DOD systems is ensured. Consequently, DOD will not have assurance that Outrider will meet user needs by the time of the planned fiscal year 1998 low-rate production decision.

Author

*Pilotless Aircraft; Military Technology; Military Operations*

**19980003289** Federal Aviation Administration, Regulatory Support Div., Oklahoma City, OK USA

**Approved Parts Course Guide and Reference Material**

1997; 85p; In English

Report No.(s): PB97-194161; AFS-600; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

No abstract available.

NTIS

*Aircraft Equipment; Aircraft Reliability*

**19980003318** Technische Univ., Faculty of Aerospace Engineering, Delft, Netherlands

**Experience with Optimal Input Design for Helicopter Parameter Identification**

Sridhar, J. K., Technische Univ., Netherlands; Place, C. S., Technische Univ., Netherlands; Breeman, J. H., Technische Univ., Netherlands; Dec. 1996; 22p; In English

Report No.(s): PB97-190151; MEMO-732; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper investigates a technique for the optimal design of helicopter control inputs, in order to provide the most accurate parameter estimates. An existing software package for optimal input design for fixed wing aircraft was modified to design control inputs for rotary wing aircraft. The design issues are discussed with some inherent problems of helicopter dynamics in mind. The design technique encompasses the salient features of Mehra's design technique in the frequency domain (using Convex Analysis) with Mulder's technique for decoupling state and parameter estimation. The input design is performed for power constrained inputs by optimizing a norm of Fisher's information matrix. The results are presented for the BO-105 helicopter, using data supplied by DLR, Germany.

NTIS

*Helicopter Control; Optimal Control; Parameter Identification; BO-105 Helicopter; Rotary Wing Aircraft; Applications Programs (Computers); Aircraft Configurations*

**19980003445** NASA Langley Research Center, Hampton, VA USA

**Guide to AERO2S and WINGDES Computer Codes for Prediction and Minimization of Drag Due to Lift**

Carlson, Harry W., Lockheed Martin Engineering and Sciences Co., USA; Chu, Julio, NASA Langley Research Center, USA; Ozoroski, Lori P., NASA Langley Research Center, USA; McCullers, L. Arnold, Vigyan Research Associates, Inc., USA; Nov. 1997; 146p; In English

Contract(s)/Grant(s): RTOP 537-09-20-02

Report No.(s): NASA/TP-3637; NAS 1.60:3637; L-17546; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The computer codes, AERO2S and WINGDES, are now widely used for the analysis and design of airplane lifting surfaces under conditions that tend to induce flow separation. These codes have undergone continued development to provide additional capabilities since the introduction of the original versions over a decade ago. This code development has been reported in a variety

of publications (NASA technical papers, NASA contractor reports, and society journals). Some modifications have not been publicized at all. Users of these codes have suggested the desirability of combining in a single document the descriptions of the code development, an outline of the features of each code, and suggestions for effective code usage. This report is intended to supply that need.

Author

*Computer Programs; User Manuals (Computer Programs); Predictions; Aerodynamic Drag*

## 06

### AIRCRAFT INSTRUMENTATION

*Includes cockpit and cabin display devices; and flight instruments.*

**19980003222**

**Experimental investigation of electromagnetic compatibility between GSM-900 cellular networks and REE of the aeronautical radionavigation service**

Bykhovsky, M., Radio Research & Development Inst. (NIIR), Russian Federation; Vysochin, V.; Lougovskoy, Y.; Tikhinski, V.; Mamchenkov, P.; IEEE International Symposium on Electromagnetic Compatibility; 1997; ISSN 0190-1494, pp. 300-303; In English; Compatibility, EMC, May 21-23, 1997, Beijing, China; Copyright; Avail: Issuing Activity

The paper deals with a EMC problems between the GSM-900 general-purpose land mobile networks and REE of the aeronautical radionavigation service resulting from the national special features of frequency allocations in Russia. Presented are the results of bench testing aimed at determination of the signal-to-interference ratio at the ARNS aircraft receiver input in the presence of unintended interference from GSM-900 network REE. The paper also describes the results of the flight test for evaluation of the ranges of interfering effects.

Author (EI)

*Electromagnetic Compatibility; Radio Navigation; Radio Equipment; Frequency Assignment; Radio Frequency Interference*

**19980003562**

**L and C band wide beam width antennae for remote controlled pilotless aircraft**

Pal, S., ISRO Satellite Cent., India; Lakshmeesha, V. K.; Barnwal, S. K.; Journal of Spacecraft Technology; July, 1997; ISSN 0971-1600; vol. Volume 7, no. no. 2, pp. 54-60; In English; Copyright; Avail: Issuing Activity

L and C band self phased, fractional turn, 3 lambda/4 wavelength quadarifilar helical antennae have been developed for airborne applications. The developed antennae are wide beamwidth, light weight and small size units providing circular polarization over a broad angular region. Also in built lightning protection mechanism has been incorporated. The development is PCB technology based.

Author (EI)

*C Band; Helical Antennas; Microstrip Transmission Lines; Pilotless Aircraft; Remote Control; Ultrahigh Frequencies; Automatic Pilots; Bandwidth*

## 07

### AIRCRAFT PROPULSION AND POWER

*Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.*

**19980003860** NERAC, Inc., Tolland, CT USA

**Ramjets: Solid Propellant, Integral Rocket/Ramjet, and Dual Combustion Mode (Latest citations from the NTIS Bibliographic Database)**

Oct. 1996; In English; Page count unavailable

Report No.(s): PB97-850853; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning advanced concepts in ramjet and turboramjet engines. These concepts pertain to the use of solid fuels, integral rocket/ramjet configurations, and dual combustion modes for ramjets used in turboramjet aircraft.

The citations cover vehicle design, fuels, air inlets, exhaust nozzles, test facilities, and test results. Applications include supersonic and hypersonic missiles, aircraft, and artillery projectiles.

NTIS

*Bibliographies; Ramjet Engines; Turboramjet Engines; Solid Rocket Propellants; Combustion*

## 09

### RESEARCH AND SUPPORT FACILITIES (AIR)

*Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.*

**19980003446** NERAC, Inc., Tolland, CT USA

**Airport Runways. (Latest citations from the Ei Compendex\*Plus database)**

Dec. 1996; In English; Page count unavailable. Supersedes PB96-853007.

Report No.(s): PB97-852909; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning design, construction, maintenance, and repair of airport runways. Studies include dynamic response of runways to aircraft loads, non-destructive tests of runway strength, and evaluation of runway properties as to roughness, slipperiness, crack propagation, and maneuverability space for various types of landing gear. Runway paving materials include concrete, synthetic polymers, asphalt, bonded layer materials, and various aggregate materials. The paving materials are developed both for initial construction and for rapid repair. Many citations refer to construction of runways in cold environments and permafrost regions, and to evaluation of landing mats. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Runways*

## 10

### ASTRONAUTICS

*Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.*

**19980003331** California Inst. of Tech., Div. of Physics, Mathematics, and Astronomy, Pasadena, CA USA

**Submillimeter Spectroscopy with a 500-1000 GHz SIS Receiver Final Report**

Zmuidzinas, J., California Inst. of Tech., USA; 1997; 20p; In English

Contract(s)/Grant(s): NAG2-744

Report No.(s): NASA/CR-97-113002; NAS 1.26:113002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Sub-millimeter Spectroscopy with a 500-1000 GHz SIS Receiver, which extended over the period October 1, 1991 through January 31, 1997. The purpose of the grant was to fund the development and construction of a sensitive heterodyne receiver system for the submillimeter band (500-1000 GHz), using our newly-developed sensitive superconducting (SIS) detectors, and to carry out astronomical observations with this system aboard the NASA Kuiper Airborne Observatory (a Lockheed C-141 aircraft carrying a 91 cm telescope). A secondary purpose of the grant was to stimulate the continued development of sensitive submillimeter detectors, in order to prepare for the next-generation airborne observatory, SOFIA, as well as future space missions (such as the ESA/NASA FIRST mission).

Derived from text

*Kuiper Airborne Observatory; Submillimeter Waves; Astronomy; C-141 Aircraft*

**19980003862** NERAC, Inc., Tolland, CT USA

**X-33: The Next Generation Space Shuttle. (Latest citations from the Aerospace Database)**

Jul. 1996; In English; Page count unavailable.

Report No.(s): PB96-871850; NASA/TM-96-113029; NAS 1.15:113029; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche



The bibliography contains citations concerning the X-33 Reusable Launch Vehicle (RLV) as a replacement for the space shuttle. The X-34 and DC-X single stage to orbit (SSTO) programs, which preceded the X-33 program, and research activities on winged space vehicles and air turbo ramjet propulsion systems are examined. Development of the aerospike propulsion system used in the X-33 is also discussed.

NTIS

*X-33 Reusable Launch Vehicle; Single Stage to Orbit Vehicles; Bibliographies; Propulsion System Configurations; Ramjet Engines; Space Shuttles*

## 11

### CHEMISTRY AND MATERIALS

*Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.*

**19980003833** Central Inst. of Aviation Motors, Moscow, Russia

**The Kinetic Nonequilibrium Processes in the Internal Flow and in the Plume of Subsonic and Supersonic Aircrafts, 28 Aug. 1996 - 28 Aug. 1997**

Starik, Alexander M., Central Inst. of Aviation Motors, Russia; 1997; 38p; In English

Contract(s)/Grant(s): NAG3-1957

Report No.(s): NASA/CR-97-206449; NAS 1.26:206449; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

(1) Our results show that under combustion of thermal destruction products of n-C<sub>8</sub>H<sub>18</sub>, and other hydrocarbon fuels with air at the equivalent ratio -0.5 and less the chemical equilibrium is not realized at the exit plane of combustion chamber and in the gas turbine and nozzle for most of small components such as NO<sub>2</sub>, NO<sub>3</sub>, HNO, HNO<sub>2</sub>, HNO<sub>3</sub>, N(x)H(y), HO<sub>2</sub>, OH. The chemical equilibrium is not realized in the internal flow of ramjet hydrogen combustion engine too. So at the nozzle exit plane both of gas-turbine hydrocarbon combustion engine and of ramjet hydrogen combustion engine the relatively large values of concentration of such small components as NO<sub>3</sub>, HNO<sub>2</sub>, N<sub>2</sub>O, HNO<sub>3</sub>, HNO, NH, N<sub>2</sub>H, HO<sub>2</sub>, H<sub>2</sub>O<sub>2</sub> may be realized. The exact definition of these component concentration as well as concentration of NO(x), OH, SO<sub>2</sub>, O, H, H<sub>2</sub>, H<sub>2</sub>O at the nozzle exit plane is very important for plume chemistry. (2) The results which were obtained for subsonic and hypersonic aircrafts indicate on the considerable change of the composition of the gas mixture along the plume. This change can be caused not only by the mixture of combustion products with the atmosphere air but by proceeding of whole complex of nonequilibrium photochemical reactions. The photodissociation processes begin to influence on the formation of the free atoms and radicals at flight altitude H greater than or equal to 18 km. Neglect of these processes can result in essential (up to 10(exp 4) times) mistakes of values gamma(sub OH), gamma(sub O), gamma(sub H), gamma(sub HSO<sub>3</sub>) and some products of CFC's disintegration. It was found that penetration of CL-containing species from the atmosphere into the exhaust flow and its interaction with nitrogen oxides leads to essential increasing of the concentration of Cl, Cl<sub>2</sub>, ClO<sub>2</sub>, ClNO<sub>3</sub>, CH<sub>3</sub>Cl and sometimes HCl and the decreasing of ClO concentration by comparison with background values. The results of our analysis show that the plume aircraft with both hydrocarbon and hydrogen combustion engine may be source of various pollutant components such as HNO, HNO<sub>4</sub>, ClO<sub>2</sub>, CH<sub>3</sub>NO<sub>2</sub>, CH<sub>3</sub>NO<sub>3</sub>, CH<sub>2</sub>O, Cl, H<sub>2</sub>O<sub>2</sub>, but not only NO, NO<sub>2</sub>, HNO<sub>2</sub>, HNO<sub>3</sub>, N<sub>2</sub>O<sub>5</sub>, SO<sub>2</sub>, SO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub> as it was supposed before.

Author

*Nonequilibrium Conditions; Kinetics; Internal Flow; Plumes; Hypersonics; Supersonic Aircraft*

## 12

### ENGINEERING

*Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.*

**19980002598** NERAC, Inc., Tolland, CT USA

**Accident Reconstruction: Latest citations from the Ei Compendex\*Plus database**

Feb. 1997; In English

Report No.(s): PB97-855506; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning modeling techniques and other methods of reconstructing traffic and aircraft accidents. Topics include photogrammetry, forensic evidence, impact computer programming, stereoscopic and video animation, and mathematical modeling. The accident of the space shuttle, Challenger, is specifically referenced. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

*Bibliographies; Aircraft Accidents*

**19980002722** Power Computing Solutions, Inc., Brook Park, OH USA

**Electric Power System for High Altitude UAV Technology Survey Final Report**

Nov. 16, 1997; 115p; In English

Contract(s)/Grant(s): NAS2-96011

Report No.(s): NASA/CR-97-206337; NAS 1.26:206337; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Electric powertrain technologies with application to high altitude Unmanned Aerial Vehicles (UAV) are assessed. One hundred twenty five solar electric UAV configurations and missions were simulated. Synergistic design opportunities were investigated with the premise that specific benefits may be realized, for example, if a single component can serve multiple functions, such as a battery being used for energy storage as well as for a structural component of the aircraft. For each UAV mission simulation, the airframe structure, powertrain configuration (type of solar cells, energy storage options) and performance baseline (1997 or 2001) were specified. It has been found that the use of the high efficiency (multijunction) solar cells or the use of the synergistic amorphous silicon solar cell configuration yields aircraft that can accomplish the majority of the missions of interest for any latitude between 0 deg and 55 deg, hence, a single versatile aircraft can be constructed and implemented to accomplish these missions.

Derived from text

*Pilotless Aircraft; Aircraft Power Supplies; Solar Cells; Flight Simulation; Amorphous Silicon*

**19980002839** NERAC, Inc., Tolland, CT USA

**Titanium. Casting Technology and Applications: Latest citations from the NTIS Bibliographic Database**

Aug. 1996; In English; Page Count Unavailable

Report No.(s): PB96-873104; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning titanium and alloy casting techniques and the properties of castings. Investment casting, centrifugal casting, hot isostatic pressing (HIP), and rapid solidification techniques are reviewed. Topics include casting molds and processes, defects and flaws, residual stresses, microstructural evolution, and critical evaluation. Applications in gas turbines and airframe structures are examined.

NTIS

*Rapid Quenching (Metallurgy); Titanium Alloys; Microstructure; Hot Isostatic Pressing; Centrifugal Casting; Aircraft Structures; Airframes*

**19980003026**

**Case study: Prediction of RFI effects of electrified railways on aeronautical radio navigation stations**

Fei, Sha, Northern Jiaotong Univ., China; Zhongyong, Jiang; Shouning, Jiang; IEEE International Symposium on Electromagnetic Compatibility; 1997; ISSN 0190-1494, pp. 167-170; In English; Compatibility, EMC, May 21-23, 1997, Beijing, China; Copyright; Avail: Issuing Activity

The case is that an electrified railway line is 300 meters away across an airport runway. The paper studies both of active and passive radio frequency interference caused by the electrified railways to aeronautical radio navigation stations, especially to Instrument Landing System (ILS). The EMC prediction model has been built. The prediction results agreed with the results of the actual flying check test.

Author (EI)

*Air Navigation; Radio Frequency Interference; Radio Navigation; Electromagnetic Interference; Rail Transportation; Aircraft Landing; Landing Aids; Electromagnetic Compatibility*

**19980003171**

**Concept design for assembly - a design theory perspective**

Egan, Michael, Chalmers Univ. of Technology, Sweden; Proceedings of the IEEE International Symposium on Assembly and Task Planning; 1997, pp. 158-163; In English; Planning, ISATP'97, Aug. 7-9, 1997, Marina del Ray, CA, USA; Copyright; Avail: Issuing Activity

This paper addresses the applicability of current Design for Assembly (DFA) approaches within the early stages of the design process based on a design theory approach. The paper initially outlines the existing problems in relating DFA approaches to product development. The proposed solution is the classification of DFA within the product development process (PDP) based on a four level design model. Three DFA integration mechanisms are introduced and related to the model as are the three modes of DFA application. The field of Concept-DFA is considered in the context of the model. Discrepancies in terminology are outlined especially between industry and academia. Different DFA approaches are modelled and existing research in the field of concept DFA is outlined. Weaknesses with both existing DFA approaches and the design model are discussed. Finally future projects addressing the existing weaknesses in DFA as highlighted by the model are discussed.

Author (EI)

*Approach Control; Product Development; Assembling; Robotics; Problem Solving*

**19980003172**

**Design-specific approach to design-for-assembly (DFA) for complex mechanical assemblies**

De Fazio, Thomas L., Charles Stark Draper Lab., Inc., USA; Rhee, Stephen J.; Whitney, Daniel E.; Proceedings of the IEEE International Symposium on Assembly and Task Planning; 1997, pp. 152-157; In English; Planning, ISATP'97, Aug. 7-9, 1997, Marina del Ray, CA, USA; Copyright; Avail: Issuing Activity

DFA issues of complex assemblies are addressed. Complex assemblies have very high parts-counts, offer limited redesign options, and their assembly is an assembly of subassemblies. Conventional DFA is inadequate for complex assemblies as it omits the combinatorial aspects of assembly such as assembly sequence choice and partitioning of subassemblies. Here, assembly sequence analysis (ASA) is used as a basis for complex-assembly DFA. Searches for favorable subassembly partitioning and assembly sequences minimize assembly difficulty as measured by kinematic degrees of freedom secured in assembly moves, while logical constraints that part geometry imposes on sequence choice are satisfied. Findings are: ASA can expose assembly issues and pinpoint DFA redesign candidates; limitations on redesign favor designing function-defining parts first; logically-characterized issues dominate the quantitatively-characterized issues when choosing sequences or partitioning; once the former issues are addressed, a quantitative sequence choice criterion often duplicates historic assembly sequence choices; and a quantitative sequence choice criterion favors sequential over branched assembly lines.

Author (EI)

*Acetylsalicylic Acid; Approach Control; Assembling; Robotics; Degrees of Freedom; Trajectory Planning; Computational Geometry*

**19980003237**

**Research on near field of airborne short wave antenna**

Xue, Zhenghui, Beijing Inst. of Technology, China; Gao, Benqing; Liu, Ruixiang; Lu, Xin; Yang, Li; IEEE International Symposium on Electromagnetic Compatibility; 1997; ISSN 0190-1494, pp. 118-121; In English; Compatibility, EMC, May 21-23, 1997, Beijing, China; Copyright; Avail: Issuing Activity

The near field of a Boeing 707 320B aircraft excited by its short wave antenna has been calculated and analyzed using FDTD Method after modeling aircraft and short wave antenna by B-spline Method. This research can provide data for the further study of the short wave antenna's impedance character far field pattern and mutual interference between short wave communication and other electronic equipment, it can play an important role in aircraft EMC analysis and design.

Author (EI)

*Aircraft Antennas; Near Fields; Antennas; Finite Difference Theory; Aircraft Communication; Electromagnetic Interference; Antenna Radiation Patterns; Directional Antennas*

**19980003593**

**Modelling and prediction of EMI coupling through antennas mounted on a cylindrical body**

Sengupta, Ms. S., Electronics Research & Development Cent. of India, India; Deb, G. K.; IEEE International Symposium on Electromagnetic Compatibility; 1997; ISSN 0190-1494, pp. 162-166; In English; Compatibility, EMC, May 21-23, 1997, Beijing, China; Copyright; Avail: Issuing Activity

In particular, military aircraft have various radar and communication equipment placed on them for different control actions. A typical Airborne early warning system normally has a large number of intentional emitters and receptors. Electromagnetic Interference can easily be coupled through various antennas used for these purpose. In this paper an aircraft fuselage is modelled as a cylindrical body and the undesired EMI couplings are mathematically calculated and the results are then presented graphically.



An algorithm is developed to predict the fundamental, third harmonic and fifth harmonic interference situations. The diffraction introduced by the curved nature of the cylindrical aircraft is considered. Few remedial measures are also suggested.

Author (EI)

*Cylindrical Bodies; Electromagnetic Interference; Aircraft Communication; Cylindrical Antennas; Algorithms*

**19980003718**

**Assembly sequence structures in design for assembly**

Barnes, C. J., Cranfield Univ., UK; Dalglish, G. F.; Jared, G. E. M.; Swift, K. G.; Tate, S. J.; Proceedings of the IEEE International Symposium on Assembly and Task Planning; 1997, pp. 164-169; In English; Planning, ISATP'97, Aug. 7-9, 1997, Marina del Ray, CA, USA; Copyright; Avail: Issuing Activity

Historically, Design For Assembly (DFA) has always been a reactive tool, most often carried out on products in production and, at best, late on in the product introduction process. Thus, a more proactive approach is required. This paper proposes the use of an assembly sequence model as the focus of such a computer-based DFA tool, which would support the development of CAD models and infer or extract relevant information.

Author (EI)

*Approach Control; Assembling; Robotics; Computer Aided Design; Production Management; Computerized Simulation*

**14**

**LIFE SCIENCES**

*Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.*

**19980003300** Systems Research Labs., Inc., Dayton, OH USA

**The Effect of Multiple High +Gz Exposure on Male and Female Isometric Strength in Both Rested and Sleepless Conditions Interim Report, Jan. 1996 - Jan. 1997**

Tripp, Lloyd D., Jr., Systems Research Labs., Inc., USA; Bolia, Steve, Systems Research Labs., Inc., USA; Chelette, Tamara, Systems Research Labs., Inc., USA; Jan. 1997; 22p; In English

Contract(s)/Grant(s): F41624-95-C-6014; AF Proj. 7184

Report No.(s): AD-A330144; AL-TR-1997-0068; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The inclusion of women into the high performance aircraft community has raised several questions concerning body strength as it relates to cockpit performance and muscular fatigue. This study evaluated isometric strength of men and women pre and post-G exposure in both a rested and sleepless state. Fourteen subjects (8 male and 6 female) took part in a study which evaluated isometric strength pre and post-Gz acceleration using a static ergometer which emulated aircraft controls. Isometric strength measures were obtained pre and post-G acceleration in both rested (8 hours of rest) or sleepless (24 hours no sleep) conditions. G-exposure consisted of flying four (3 minute) closed loop flight simulations in the Dynamic Environment Simulator (centrifuge). No significant changes in strength were observed within groups of men and women when comparing pre-G rested upper and lower body strength measures. There were, however, significant differences between both groups. Women were 53 percent as strong as the men. Despite the significant differences in baseline strength measures between men and women, there were no significant differences in maximum isometric strength post-G acceleration in either the rested or sleepless conditions.

DTIC

*Flight Simulation; Muscular Fatigue; Performance Tests; Aircraft Control; Females; Exposure; Feedback Control; Environment Simulators*

**15**

**MATHEMATICAL AND COMPUTER SCIENCES**

*Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.*

**19980002951** Nanjing Univ. of Aeronautics and Astronautics, Nanjing, Jiangsu, China

**Journal of Nanjing University of Aeronautics and Astronautics, December 1996, Volume 28**

Jun. 1996; 167p; In Chinese; Portions of this document are not fully legible; See also PB97-118871 and PB97-118889

Report No.(s): PB97-135644; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Partial Contents: Efficient Sensitivity Analysis of Aeroelastic Response and Hub Loads for a Helicopter Rotor; Numerical Calculation of 3-D Flow Fields for Lobed Mixer; A New Theoretical Study of Dynamic Load Identification Based on Generalized Polynomial Expansion; A New Algorithm for Solving the Inverse Eigenvalue Problem of a Jacobi Matrix; Study on Mathematic Simulation of VSCF Electric Power Generating Systems; Chaotic Behavior Prediction: An Improved Codebook Prediction Algorithm; The Model Characters of Medium Temporal Logic; and Application of CAD Techniques for Designing of Packaging Decoration.

NTIS

*Aeroelasticity; Computer Aided Design; Algorithms; Temporal Logic; Rotary Wings; Polynomials; Loads (Forces); Flow Distribution; Eigenvalues; Dynamic Response; Dynamic Loads*

## 16 PHYSICS

*Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.*

**19980002835** NASA Langley Research Center, Hampton, VA USA

### **Quelling Cabin Noise in Turboprop Aircraft via Active Control**

Kincaid, Rex K., College of William and Mary, USA; Laba, Keith E., College of William and Mary, USA; Padula, Sharon L., NASA Langley Research Center, USA; Journal of Combinatorial Optimization; Aug. 19, 1997, no. No. 1, pp. 1-22; In English Contract(s)/Grant(s): NAG1-1783

Report No.(s): NASA/CR-97-206448; NAS 1.26:206448; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Cabin noise in turboprop aircraft causes passenger discomfort, airframe fatigue, and employee scheduling constraints due to OSHA standards for exposure to high levels of noise. The noise levels in the cabins of turboprop aircraft are typically 10 to 30 decibels louder than commercial jet noise levels. However, unlike jet noise the turboprop noise spectrum is dominated by a few low frequency tones. Active structural acoustic control is a method in which the control inputs (used to reduce interior noise) are applied directly to a vibrating structural acoustic system. The control concept modeled in this work is the application of in-plane force inputs to piezoceramic patches bonded to the wall of a vibrating cylinder. The goal is to determine the force inputs and locations for the piezoceramic actuators so that: (1) the interior noise is effectively damped; (2) the level of vibration of the cylinder shell is not increased; and (3) the power requirements needed to drive the actuators are not excessive. Computational experiments for data taken from a computer generated model and from a laboratory test article at NASA Langley Research Center are provided.

Author

*Jet Aircraft Noise; Active Control; Aeroacoustics; Noise Intensity; Noise Reduction; Vibration; Actuators*

**19980002890** Purdue Univ., School of Aeronautics and Astronautics, West Lafayette, IN USA

### **The Use of Kirchhoff's Method in Jet Aeroacoustics Final Report, 1 Mar. 1994 - 15 Sep. 1994**

Lyrantzis, Anastasios S., Purdue Univ., USA; 1995; 17p; In English

Contract(s)/Grant(s): NAG1-1605

Report No.(s): NASA/CR-97-112990; NAS 1.26:112990; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Supersonic jet aeroacoustics will be studied using computational techniques. In the study, a Kirchhoff method is used to predict flow generated noise in the mid- and far-fields. This type of method shows promise because it is based on surface integrals and not the volume integrals found in traditional acoustic prediction methods. The Kirchhoff method is dependent on accurate prediction of flow variables in the near-field. Here, computational fluid dynamics (CFD) programs are used for these predictions. Specifically, an existing large eddy simulation (LES) code will be modified for aeroacoustic applications. Issues involved in the implementation of the Kirchhoff method as well as the coupling with the CFD code will be discussed. Important physical noise parameters will be identified and investigated in the study.

Author

*Aeroacoustics; Supersonic Jet Flow; Computerized Simulation; Large Eddy Simulation; Jet Aircraft Noise; Far Fields*

19  
GENERAL

**19980002686** Nanjing Univ. of Aeronautics and Astronautics, Nanjing, Jiangsu, China

**Journal of Nanjing University of Aeronautics and Astronautics, Volume 28**

Azhou, Z., Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China; Oct. 1996; 168p; In Chinese; Original contains color illustrations

Report No.(s): PB97-118889; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This current journal include the following: Striving for Better Quality and More Brilliancy; Yearly List of Publications of Journal of NUAA for 1956 -1960; Contents of Journal of NUAA, 1956-1960; Contents of Journal of NUAA, 1963-1965; Contents of Journal of NUAA, 1977-1996; First Ten Authors Having Most Papers Issued by Journal of NUAA in 1956-1996; Papers Indices of the First Ten Authors Having Most Papers Issued by Journal of NUAA in 1956 -1996; Prize Winning List of Journal of NUAA; List of 'Excellent Editorial Workers' of Journal of NUAA; List of 'Excellent Editorial Papers' of Journal of NUAA; Study of Language Characteristics of Scientific Papers; A Method of Drawing Illustrations in Sci-Tech Journals on Computer; and Multi-media CD-ROM and Science & Technology Editor.

NTIS

*Research and Development; Aerospace Engineering; Aeronautical Engineering*

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